

Summary of Adverse Impacts of Diesel Particulate Matter

Diesel engines emit a complex mix of pollutants, the most visible of which are very small carbon particles or "soot", known as diesel PM. Diesel exhaust also contains over 40 cancer-causing substances, most of which are readily adsorbed on the soot particles. In 1998, California identified diesel PM as a toxic air contaminant based on its potential to cause cancer, premature death, and many other health problems. In addition, several international and national health agencies have concluded that diesel exhaust has the potential to contribute to cancer and other health effects¹. These agencies include the National Institute of Occupational Safety and Health (1988), the International Agency for Research on Cancer (1989), the World Health Organization (1996), the National Toxicology Program (2000) and the U.S. EPA (2002).

Overall, diesel engine emissions are responsible for a majority of California's estimated cancer risk attributable to air pollution. In addition, diesel PM is a significant fraction of California's particulate pollution problem. Assessments by ARB and U.S. EPA estimate that diesel PM contributes to approximately 2,000 premature respiratory and cardiovascular deaths and thousands of hospital admissions annually in California².

The estimates of the magnitude of the contribution of diesel PM to air pollution related deaths are based on health studies involving ambient particulate matter pollution in general. The method used to quantify diesel PM's effect likely underestimates its contribution because this method assumes that diesel PM, per unit of concentration, has the same health impact as general ambient particulate matter. However, the combination of several factors strongly suggests that diesel emissions pose a significantly greater health threat than non-combustion particle pollution.

These factors include the following³:

- Diesel PM is more often emitted close to people so high exposures often occur
- Diesel PM more readily deposits in the lung and can be absorbed in the body
- Diesel PM contains compounds known to damage DNA and cause cancer

In addition, there are other important reasons to reduce diesel PM pollution:

- The value of the health benefits are expected to vastly exceed the control costs
- Diesel PM causes visibility reduction, and
- Diesel PM is a potent contributor to global warming

¹ See Attachment 1 for summary of the findings of these agencies

² See Attachment 2 for more complete discussion of the evidence linking particle pollution and diesel PM to adverse health effects, including a listing of references

³ Also discussed in Attachment 2

Attachment 1 Brief Summary of Diesel Hazard Assessments⁴

Agency & Date	Summary of Findings
NIOSH 1988	<ul style="list-style-type: none">• Animal evidence “confirmatory” for carcinogenesis• Human evidence “limited”• Diesel exhaust classified as “potential occupational carcinogen”
IARC 1989	<ul style="list-style-type: none">• Rat data “sufficient” for carcinogenicity• Human epidemiology data “limited”• Diesel exhaust considered a “probable” human carcinogen
WHO 1996	<ul style="list-style-type: none">• Rat data support carcinogenicity• Human epidemiology data suggests “probably carcinogenic”• Epidemiology studies considered “inadequate for a quantitative estimate of human risk”
California EPA 1998	<ul style="list-style-type: none">• Rat data “have demonstrated” carcinogenicity of diesel exhaust particles• Causal association of diesel exhaust and lung cancer in epidemiology studies is a “reasonable and likely explanation”• Designated diesel particulate matter a “toxic air contaminant”
NTP 2000	<ul style="list-style-type: none">• Diesel exhaust particulates listed as “reasonably anticipated to be a human carcinogen” based on findings of elevated lung cancer in occupational groups exposed to diesel exhaust and supporting animal and mechanistic studies.
EPA 2002	Diesel emissions considered “likely to be carcinogenic to humans” <ul style="list-style-type: none">▪ strong but less than sufficient epidemiologic evidence;▪ evidence of carcinogenicity of diesel exhaust particles in rats and mice by <u>non inhalation</u> routes of exposure;▪ extensive supportive data including the demonstrated mutagenic and/or chromosomal effects of DE and its organic constituents and knowledge of the known mutagenic and/or carcinogenic activity of a number of individual organic compounds present on the particles and in DE gases.

Health Effects of Diesel Exhaust

⁴ Summary taken from “The Advanced Collaborative Emissions Study (ACES), Project Plan for Emission Characterization and Health Effects Assessment”